DOCUMENT RESUME

ED 230 771 CE 036 230

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TITLE	Competency Test Items for Applied Principles of Agribusiness and Natural Resources Occupations. Agricultural Production Component. A Report of Research.
INSTITUTION	Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
PUB DATE	Apr 83
NOTE	43p.; For related documents, see CE 036 227-232.
PUB TYPE	Reports - Research/Technical (143) -- Tests/Evaluation Instruments (160)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Agribusiness; *Agricultural Education; Agricultural Engineering; Agricultural Occupations; *Agricultural Production; *Agronomy; *Animal Husbandry; Behavioral Objectives; Competency Based Education; *Criterion Referenced Tests; *Farm Management; Multiple Choice Tests; Natural Resources; Secondary Education; Test Construction; Test Items; Vocational Education
IDENTIFIERS	Florida

ABSTRACT

An activity was undertaken to develop written criterion-referenced tests for the agricultural production component of Applied Principles of Agribusiness and Natural Resources Occupations. Intended for tenth grade students who have completed Fundamentals of Agribusiness and Natural Resources Occupations, applied principles were designed to consist of three components, with each component comprising one-third of the school year. The agricultural production component was designed as a specialized component to be taught together with the common core and one other specialized component. A criterion-referenced test was developed for the agricultural production component from a list of competencies that was compiled. Project results were a list of specific competencies for the agricultural production component of Applied Principles of Agribusiness and Natural Resources Occupations and an item bank of multiple choice test items and answer keys for the agricultural production component. Criteria for selecting items from the item bank for testing purposes were recommended. (Two tables display summary statistics and complete item analyses for each question in the item bank. Appendixes, amounting to over one-half of the report, contain the list of competencies, test items, and answer keys.) (YLB)

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COMPETENCY TEST ITEMS FOR APPLIED PRINCIPLES OF AGRIBUSINESS AND NATURAL RESOURCES OCCUPATIONS

AGRICULTURAL PRODUCTION COMPONENT

A Report of Research

Jimmy G. Cheek
Max B. McGhee

U.S. DEPARTMENT OF EDUCATION
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April, 1983

CE036230

ACKNOWLEDGEMENTS

The writers wish to express gratitude to the agribusiness and natural resources education teachers, state administrative staff in agricultural education, teacher educators in agricultural education, and county supervisors in agricultural education throughout the state of Florida who participated in development and critique of this instrument. Without their assistance, this study would not have been possible.

Thanks also go to the graduate students who were involved with this study, specifically Glenn Osterhout, Coleen Kaczor, Gail Chesnut, and Teron Jackson. Appreciation is also extended to Lynne Kirkland, Barbara Schatt, and Roxann Mayros for typing this document and to Jane McCoy for the art work.

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Introduction

The Vocational Education Act of 1963 and the Vocational Education Amendments of 1968 provided the foundation upon which the scope of traditional vocational education programs have been broadened and new programs have been initiated. As a result, vocational agriculture/agribusiness has been characterized by accelerated growth, expanded program offerings, and increased emphasis. For example, in 1967-68, Florida had 229 vocational agriculture/agribusiness departments and employed 284 teachers. According to Kirkland (1979), by the 1978-79 school year the number of departments had increased 62 percent (373 departments) and the number of teachers employed had increased by 103 percent (576 teachers). In the 1982-83 school year, there were 409 departments employing 573 vocational agriculture teachers (Department of Agricultural and Extension Education, University of Florida, 1982).

During this same period of time, there has been an increased emphasis regarding the need to develop and improve approaches for evaluating educational programs. Currently, a great deal of attention is being given to the concept of accountability in education. Effective educational evaluation is vital for improving education programs since it provides the basis upon which to determine the merits of existing programs, the need for new programs, and revision of existing programs.

In this atmosphere of accountability, legislators, educators, and the general public are asking if expenditures for vocational education are producing desired results and funding agencies are asking for evaluative information upon which to base policy decisions. Moreover, a review of the Vocational Educational Amendment of 1976 (American Vocational

Journal, 1976) makes it clear that the writers of that legislation expect evaluations of vocational education programs to yield data and information useful in formulating on-going and future policy and program decisions. However, from a review of a report to the Governor of Florida, it is obvious that sufficient data regarding the effectiveness of vocational education is not available, thus lending further support for the need to investigate this area (Governor's Commission on Secondary Schools, 1983).

In addition, competency-based education is a development receiving considerable attention in the literature and from professional educators. Florida is currently involved in a major effort to implement competency-based vocational education (Harrington, Johnson, Fagan, Freedman, and Reichman, 1976; Fagan and Huckaby, 1982). Using this instructional model, the curriculum is built around objectives that industry recognizes as necessary for employment. In addition, this model places major emphasis on evaluation of educational programs in terms of pre-specified outcomes, requiring that program outcomes be specified in terms of the behaviors, competencies, and performance capabilities expected of students completing instructional programs. Consequently, one measure of program effectiveness is the extent to which students completing or leaving an instructional program possess or fail to possess the behaviors and competencies specified in the instructional objectives. In instructional systems of this nature, test information is not only used to evaluate program effectiveness, but can also be used to evaluate the student's mastery of instructional objectives as an aid to placing students in appropriate employment or in additional instructional situations (Glasser and Nitko, 1971). Instruments or tests designed especially for this purpose are known as criterion-referenced tests (Hambleton and Novick, 1972).

Criterion-referenced tests are defined as tests made up of items keyed to a set of specific behavioral objectives (Ivens, 1970). Others have defined a criterion-referenced test as one that is deliberately constructed so as to yield measurements that are directly interpretable in terms of specified performance standards (Glasser and Nitko, 1971).

Criterion-referenced instruments have not been developed so that program effectiveness and student achievement can be assessed in most areas of agribusiness and natural resources. This activity was designed to develop criterion-referenced tests for the agricultural production component of Applied Principles of Agribusiness and Natural Resources Occupations.

Applied Principles of Agribusiness and Natural Resources Occupations (3720) is primarily designed to be taught at the tenth grade level and students who enroll should have completed Fundamentals of Agribusiness and Natural Resources Occupations (3710) in the ninth grade. Applied Principles consists of three components with each component designed to utilize one-third of the school year (60 days). All students complete the common core component consisting of competencies common to all agricultural/agribusiness occupations. The common core competencies are divided into three instructional areas: agricultural business management; agricultural mechanics; and leadership and citizenship development. Instructors then select two specialized components to complete the Applied Principles course from the following taxonomies: agricultural mechanics; agricultural production; agricultural products; agricultural resources; agricultural supplies and services; forestry; and ornamental horticulture. Each of these components are taught for one-third of the school year (60 days) and these two

components should be selected so as to provide the basic competencies for specialized programs offered at the eleventh and twelfth grade. More detailed descriptive information and specific planning data are available in the publication A Suggested Curriculum Guide for Applied Principles of Agribusiness and Natural Resources Occupations (Panhandle Area Educational Cooperative and Florida Department of Education, 1980).

Purpose

The central purpose of this study was to develop and field test written criterion-referenced tests for the agricultural production component of Applied Principles of Agribusiness and Natural Resources Occupations. In order to achieve this purpose, the following objectives were developed as guidelines for conducting the research:

1. Develop and compile a list of competencies for the agricultural production component of Applied Principles of Agribusiness and Natural Resources Occupations.

2. Develop a criterion referenced test for the agricultural production component of Applied Principles of Agribusiness and Natural Resources Occupations.

3. Field test the instrument in order to determine instrument validity and reliability, and to determine item difficulty, item discrimination, and point biserial correlation for each test item.

Procedure

Objective 1

Based upon the objectives identified in the Applied Principles of Agricultural Occupations Curriculum Guide (Curriculum Materials Center, 1978), a list of competencies was generated and compiled. This list was reviewed and modified by a group of teachers, Florida Department of Education regional consultants for agribusiness, and University of Florida faculty members at a Curriculum Development Workshop held in August, 1980 (Panhandle Area Educational Cooperative and Florida Department of Education, 1980). The competency statements reported in this document have undergone minor refinements in wording since their original publication in 1980. These competencies represent the performance standards relating to Applied Principles that students should master prior to entering specialized programs of agribusiness and natural resources education.

Objective 2

Using the competency statements derived in Objective 1, test items were developed for each competency statement. A consultant staff of teachers, regional consultants, and University faculty members was asked to review and revise the items developed. The consultant staff was specifically asked to accomplish the following tasks:

1. To review and revise individual test items.

2. To make certain that the items were technically accurate.

3. To verify that the item did assess the competency it was purported to address.

As a result of this activity, minor changes were made in the test.

Objective 3

The instrument was field tested by administering it to groups of students who had completed Applied Principles of Agribusiness and Natural Resources Ocupations. The data from the field tests were analyzed for item difficulty, item discrimination, and point biserial correlation. A Kuder-Richardson 20 Correlation was calculated as the measure for test reliability.

Results

The major results of this project were: a list of specific competencies for the agricultural production component of Applied Principles of Agribusiness and Natural Resources Occupations (see Appendix A) and an item bank of multiple choice test items and an answer key for the agricultural production component (see Appendix B).

Summary statistics relative to the agricultural production component of Applied Principles are presented in Table 1. The estimate of reliability of the test by the Kuder-Richardson 20 correlation coefficient was .89.

TABLE 1
Summary Statistical Data Relative to the
Agricultural Production Component of
Applied Principles of Agribusiness
and Natural Resources Occupations

Instructional Area	Factor	Statistic
Agricultural Production	Number of Students Taking Test	34.00
	Total Number of Items on Exam	93.00
	Highest Possible Score	93.00
	High Score	67.00
	Low Score	17.00
	Mean Score	44.41
	Median Score	46.50
	Mode Score	29.00
	Standard Deviation	12.80
	Standard Error of Measurement	4.28
	Kuder-Richardson 20 Correlation	0.89

A complete item analysis for each question in the item bank relative to agricultural production is displayed in Table 2. It may be observed that three statistics are presented: item difficulty; item discrimination; and item point biserial coefficient. Item difficulty (index of difficulty) is defined as the proportion of students who correctly answer an item. The average difficulty of a test is the average of the individual item difficulties. For maximum discrimination among students, an average difficulty of .60 is ideal.

Item discrimination (index of discrimination) is a numerical indicator of how the poorer students answered the item as compared to how the better students answered the item. The scores are divided into three groups with the top 27 percent of the scores in the upper group and the bottom 27 percent in the lower group. The number of correct responses for an item by the lower group is subtrated from the number of correct responses for the item in the upper group. The difference in the number correct is divided by the number of students in either group. The process is repeated for each item.

The point-biserial correlation coefficient is computed for the relationship between a variable for which there are only two categories of scores and a variable for which the scores exist on a continuous distribution. Thus, it is a correlation coefficient indicating the relative degree of relationship between how a student responds to an item and the student's total score on the test.

TABLE 2

Item Analysis of the Item Bank of Questions for the Agricultural Production Component of Applied Principles of Agribusiness and Natural Resources Education

Item Bank Number	Item Difficulty	Item Discrimination	Item Point Biserial Correlation
1	0.44	0.3	0.23
2	0.74	0.67	0.46
3	0.79	0.56	0.64
4	0.35	0.00	0.09
5	0.50	0.11	-0.01
6	0.38	-0.11	0.04
7	0.53	0.44	0.37
8	0.29	0.33	0.10
9	0.68	0.56	0.37
10	0.71	0.56	0.43
11	0.44	0.44	0.29
12	0.68	0.33	0.35
13	0.47	0.33	0.33
14	0.62	0.44	0.26
15	0.53	-0.11	0.02
16	0.71	0.56	0.27
17	0.15	0.00	0.13
18	0.24	0.11	0.05
19	0.53	0.56	0.45
20	0.32	-0.22	-0.15
21	0.56	0.44	0.34
22	0.38	0.00	0.00
23	0.59	0.00	0.07
24	0.53	0.00	0.11
25	0.53	0.56	0.31
26	0.71	0.33	0.30
27	0.32	0.33	0.28
28	0.38	0.67	0.43
29	0.24	0.22	0.06
30	0.85	0.44	0.54
31	0.76	0.44	0.38
32	0.85	0.22	0.31
33	0.79	0.67	0.54
34	0.41	0.11	0.05
35	0.56	0.00	0.02

Table 2 (Continued)

Item Bank Number	Item Difficulty	Item Discrimiantion	Item Point Biserial Correlation
36	0.47	0.22	0.07
37	0.38	0.22	0.19
38	0.62	0.44	0.43
39	0.21	0.22	0.13
40	0.85	0.22	0.21
41	0.41	0.33	0.23
42	0.41	0.67	0.52
43	0.47	0.56	0.46
44	0.41	0.22	0.24
45	0.35	0.44	0.36
46	0.68	0.22	0.19
47	0.71	0.67	0.50
48	0.62	0.33	0.36
49	0.35	-0.11	-0.00
50	0.68	0.56	0.31
51	0.65	0.67	0.50
52	0.76	0.33	0.22
53	0.71	0.44	0.43
54	0.71	0.56	0.59
55	0.68	0.33	0.44
56	0.44	0.44	0.36
57	0.21	0.22	0.21
58	0.44	0.22	0.16
59	0.44	0.22	0.13
60	0.65	0.33	0.42
61	0.74	0.44	0.44
62	0.68	0.78	0.62
63	0.65	0.56	0.52
64	0.21	0.22	0.33
65	0.44	0.78	0.54
66	0.21	0.22	0.25
67	0.21	0.22	0.30
68	0.41	0.44	0.37
69	0.41	0.44	0.31
70	0.12	0.11	0.15

Table 2 (Continued)

Item Bank Number	Item Difficulty	Item Discrimination	Item Point Biserial Correlation
71	0.53	0.33	0.40
72	0.47	0.67	0.58
73	0.44	0.11	0.20
74	0.29	0.33	0.35
75	0.41	0.11	0.17
76	0.65	0.67	0.54
77	0.50	0.33	0.32
78	0.24	0.11	-0.01
79	0.38	0.67	0.44
80	0.35	0.33	0.30
81	0.09	0.11	0.08
82	0.35	0.33	0.21
83	0.41	0.44	0.29
84	0.50	0.33	0.41
85	0.41	0.33	0.30
86	0.26	0.00	0.04
87	0.62	0.67	0.46
88	0.24	0.22	0.22
89	0.38	0.67	0.53
90	0.35	0.78	0.69
91	0.15	0.11	0.01
92	0.18	0.33	0.35
93	0.29	0.00	0.02

It is recommended that the following criteria be used for selecting items from the item banks for testing purposes:

1. Select items that pertain to the instructional objectives which specify the outcomes sought in the instructional program.

2. Select items that have a positive item discrimination index and a positive point biserial correlation coefficient.

3. Select items that were answered correctly by a substantial percentage of the students as indicated by the item difficulty score.

4. Select items that have high point biserial correlation coefficients thus indicating a relatively high relationship between how a student responds to the item and the student's total score on the test.

Recommendations

Based upon the results obtained from this activity, the following recommendations were made:

1. The student assessment test can be used by teachers who are interested in determining how well their students are achieving the competencies that are prescribed for the Applied Principles curriculum. These data should provide a reliable method of determining which instructional areas need further development or improvement.

2. It is recommended that the criteria, specified in the results section of this document, be used to select items for testing purposes.

3. Research be initiated to assess program effectiveness and student achievement in Applied Principles using a sample of the programs in Florida.

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APPENDIX A

Competencies for the Agricultural Production Component
of Applied Principles of Agribusiness and
Natural Resources Occupations

COMPETENCIES FOR THE AGRICULTURAL PRODUCTION COMPONENT OF APPLIED PRINCIPLES OF AGRIBUSINESS AND NATURAL RESOURCES OCCUPATIONS

1. The student will formulate a ration for a specific class of animals.
2. The student will identify three major organs of the cow's reproductive tract.
3. The student will identify the functions of each major organ in the cow's reproductive tract.
4. The student will be able to identify three major organs of the bull's reproductive tract.
5. The student will identify the functions of each major organ in the bull's reproductive tract.
6. The student will manage facilities related to animal production and including waste disposal.
7. The student will analyze animal production records and data.
8. The student will develop and maintain breeding records.
9. The student will perform minor management practices such as tagging, dehorning, and castrating.
10. The student will determine the best crop to grow on special land areas.
11. The student will identify control measures for insects attacking crops.
12. The student will identify control measures for crop diseases.
13. The student will plan a weed control program for crops.
14. The student will select appropriate cultural practices for crops.
15. The student will fertilize crops according to recommended practices.
16. The student will practice safety when applying pesticides.
17. The student will keep crop production records.

18. The student will analyze crop production records.

19. The student will determine needs for insurance.

20. The student will plan labor and capital needs.

21. The student will identify marketing outlets.

22. The student will trouble shoot for minor farm power and machinery problems.

23. The student will use service and repair manuals.

24. The student will demonstrate the use of major farm machinery units such as plows, discs, and mowers.

APPENDIX B

Item Bank of Multiple Choice Test Items
and Answer Key for the Agricultural
Production Component of Applied
Principles of Agribusiness
and Natural Resources
Occupations

Item Bank of Test Items for the Agricultural Production Component of Applied Princples of Agribusiness and Natural Resources Occupations

Competency:

The student will formulate a ration for a specific class of animals.

1. Which of the following feeds is a concentrate?

   a. Hay
   b. Corn
   c. Cellulose
   d. Pasture grass

2. Roughage is a type of feed that is:

   a. High in fats
   b. High in fiber
   c. High in digestibility
   d. Low in protein

3. Which of the following elements should be considered when formulating a ration for beef cattle?

   a. Trace minerals
   b. Calcium and phosphorus content
   c. Salt
   d. All of the above

4. Which of the following methods would an experienced feeder use to plan rations for cattle on full feed?

   a. Feeds in amounts equal to about 2.5% of their live weight.
   b. 70 to 75% concentrates.
   c. A minimum of 0.5 lbs. roughage for each 100 lbs. live weight.
   d. All of the above

5. In computing roughage consumption for dairy cows, three pounds of silage are considered equal to one pound of hay.

   a. True
   b. False

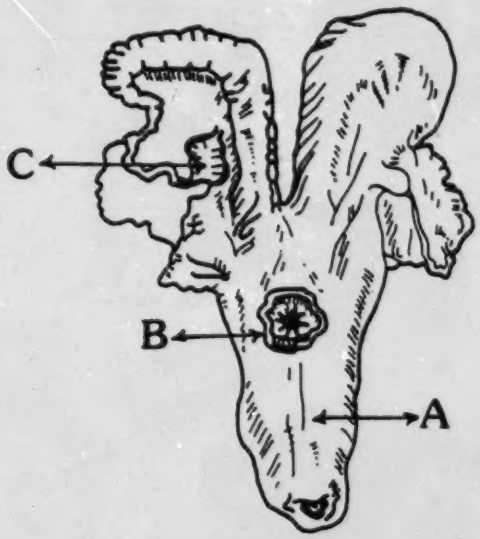
6. How many pounds of roughage are needed to provide 40% roughage in a feed ration of 150 pounds?

a. 35 pounds
b. 50 pounds
c. 60 pounds
d. 75 pounds

Competency:

The student will identify three major organs of the cow's reproductive tract.

Use the following diagram for the next three questions:



7. The name of organ A is the:

a. Vagina
b. Cervix
c. Uterus
d. Ovary

8. The name of organ B is the:

a. Vagina
b. Cervix
c. Uterus
d. Ovary

9. The name of organ C is the:

a. Vagina
b. Cervix
c. Uterus
d. Ovary

Competency:

The student will identify the function of each major organ in the cow's reproductive tract.

10. Which of the following organs does a fertilized egg attach to and develop in?

a. Oviduct
b. Uterus
c. Uterine horn
d. Vagina

11. Which of the following organs separates the uterus from the vagina?

a. Oviduct
b. Vaginal Canal
c. Right Uterine Horn
d. Cervix

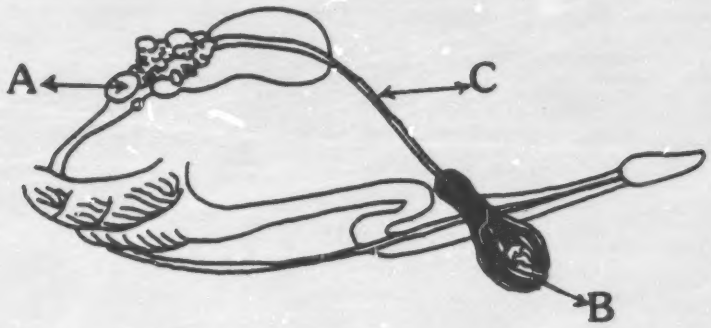
12. The process of ovulation means:

a. Union of an egg and sperm
b. Birth of a newborn animal
c. Release of a mature egg into the oviduct
d. Actual mating of two animals

Competency:

The student will identify three major organs of the bull's reproductive tract.

Use the following diagram for the next three questions:



13. The name of organ A is the:

a. Testicle
b. Glans penis
c. Vas deferens
d. Prostate glands

14. The name of organ B is:

a. Testicle
b. Glans penis
c. Vas deferens
d. Prostate glands

15. The name of organ C is:

a. Testicle
b. Glans penis
c. Vas deferens
d. Prostate glands

Competency:

The student will identify the function of each major organ of the bull's reproductive tract.

16. The organ in a bull's reproductive tract which produces the sperm cells is called the:

a. Testicle
b. Vas Deferens
c. Prostate Gland
d. Glans Penis

17. The organ in the bull's reproductive tract which produces the male hormone, testosterone, is called the:

a. Testicle
b. Vas Deferens
c. Prostate Gland
d. Glans Penis

18. The organ in the bull's reproductive tract which produces a seminal fluid that is discharged with the sperm is called the:

a. Testicle
b. Vas Deferens
c. Prostate Gland
d. Glans Penis

Competency:

The student will manage facilities related to animal production and including waste disposal.

19. A farmer or rancher can insure himself of a good supply of organic matter and the three nutrients - nitrogen, phosphorus, and potassium, if he will build which of the following structures?

a. A trench silo
b. A feed alley
c. A manure pit
d. A farrowing shed

20. When planning to use a power operated manure loader, what is the recommended minimum ceiling height?

a. 8 feet
b. 9 feet
c. 10 feet
d. 12 feet

21. Which of the following flooring is the most satisfactory for a central hog house?

a. Clay
b. Wood
c. Dirt
d. Concrete

Competency:

The student will analyze animal production records and data.

22. When analyzing livestock production, which of the following testing procedures would be used?

    a. Performance and Progency testing
    b. Longevity and weight gain records
    c. Breeding and marketing surveys
    d. Size and number of livestock

23. 100 head of swine averaged 40 pounds a piece when purchased, and the same herd had a total weight of 12,500 pounds when brought to market. What was the average weight increase per pig during the time period from buying to selling the herd?

    a. 75 pounds
    b. 80 pounds
    c. 85 pounds
    d. 90 pounds

24. In a record book, the item "sold 3 calves for 100 dollars each" would be entered as:

    a. A cost factor
    b. An income factor
    c. An inventory item
    d. A depreciation item

25. A steer that gains 4 pounds per day on the average would have a rate of gained weight that is:

    a. High
    b. Medium
    c. Low
    d. Not possible

26. Farmer Brown harvests 60 bushels of corn per acre on a 500 acre farm and sells that corn for $3.00 a bushel. How much money did the corn crop gross that year?

    a. $ 50,000
    b. $ 75,000
    c. $ 90,000
    d. $100,000

30. Standard tattoo pliers are pictured by choice _____.

31. An emasculators is pictured by choice _____.

32. A dehorning instrument is pictured by choice _____.

33. Bull leads are pictured by choice _____.

Competency:

The student will determine the best crop to grow on special land areas.

34. The land capability class of the soil refers to:

a. The use that the land is presently being used for.
b. A number that subdivision developers use in locating development land.
c. The most intensive use that the soil is capable of being used for in farming.
d. A classification of land based on the highest and best use of that land.

35. Class VI land should be used for:

a. Forestry
b. Cropland
c. Pasture land
d. Non-Agricultural uses

36. Sod-based rotation would be used on:

a. Class I soils
b. Class II soils
c. Class III soils
d. Class IV soils

37. Class III land should be:

a. Cropped every other year
b. Used for forestry
c. Used for pasture
d. Abandoned

Competency:

The student will identify control measures for insects attacking crops.

38. Which of the following methods is a means of natural control of insects?

a. Climatic factors
b. Soil type
c. Control by natural enemies
d. All of the above

39. An insecticide may be defined as a:

a. Poison that affects specific parts or organs of an insect.
b. Chemical that can kill any and every kind of insect.
c. Non-hazardous chemical that is easily degraded by natural methods.
d. Poison that controls insects and disease on crops.

40. Which of the following statements about the application of insecticides is FALSE?

a. Use insecticides only as directed on the label for crops and purposes listed.
b. Use protective clothing and equipment when recommended.
c. Apply insecticides as close to harvest as possible to protect the crop.
d. Never apply insecticide dust on a windy day.

Competency:

The student will identify control measures for crop diseases.

Match the following choices with its correct definition for numbers 41-45.

A. Avoidance
B. Exclusion
C. Eradication
D. Protection
E. Resistance

41. Keeping pathogens out of a disease free area is called ____.

42. Using plants that tolerate, resist, or are immune to the disease is called _____.

43. Avoiding plant disease by planting when and where the pathogens are ineffective or absent is called _____.

44. Preventing an infection of a crop by using a chemical or physical barrier to keep pathogens out is called _____.

45. Eliminating the pathogen source, whether it be an infected plant, field, or region is called _____.

46. What is a tiny, tubular, unsegmented, eel-like worm that feeds on plant roots and forms cysts called?

a. Nematode
b. Virus
c. Bacteria
d. Fungus

Competency:

The student will plan a weed control program for crops.

47. What is a herbicide?

a. A treatment given to counteract the effects of a poison.
b. A pesticide that must be diluted before application.
c. An agricultural chemical used to control unwanted plants.
d. A chemical that destroys nematodes.

48. The percent of weed seeds in the following bag of soybean seed is:

TOWER SEEDS

Purity 99.8%	60.0 lbs. Net
0. Crop 0.18%	Germ. 88.0%
Weeds 0.01	
Inert 0.01	Tested 7/80

a. 0.001 percent
b. 0.01 percent
c. 0.18 percent
d. 7 - 9 percent

49. Which of the following statements is FALSE?

a. Herbicides reduce the need for tillage.
b. Weeds can be mowed to prevent seed production.
c. Flooding of rice fields helps control weeds by excluding air.
d. Weed seeds do not stay dormant in the soil for years.

Competency:

The student will select appropriate cultural practices for crops.

50. Which of the following statements is FALSE?

a. Seed is often treated with chemicals to reduce insect damage.
b. Chemicals applied during the growing season help control weeds, insects, and crop disease.
c. A shortage of plant nutrients will not limit yield or affect the quality of a crop.
d. Chemicals applied to harvested products help prevent spoilage and insect damage.

51. Which of the following is used to correct the pH of an acid soil?

a. Gypsum
b. Lime
c. Calcium
d. Phosphorus

52. Crops should be harvested as soon as possible to decrease the likelihood of exposure to disease.

a. True
b. False

53. Continual production of the same crop on the same piece of land can contribute to disease build-ups.

a. True
b. False

54. Plant spacing affects disease control and weed infestation, but not nutrient uptake.

a. True
b. Fale

55. An example of crop rotation that has been successful in disease control is soybean-potato rotation against potato scab.

a. True
b. False

Competency:

The student will fertilize crops according to recommended practices.

56. Which of the following is NOT a primary plant nutrient?

a. Nitrogen
b. Potassium
c. Calcium
d. Phosphorus

57. Which of the following minerals stimulates early root growth and blooming, and hastens crop maturity?

a. Nitrogen
b. Potassium
c. Phosphorus
d. Calcium

58. Which of the following fertilizer management statements is FALSE?

a. Higher yield is the most frequent benefit of fertilizer use.
b. A well fertilized crop is better able to resist disease, insect, and weed infestations.
c. For fertilization to be worthwhile, the benefits have to outweigh the costs.
d. Formulation and analysis of fertilizer does not affect the purchase price.
e. Fertilizer placement is critical if optimum results are to be achieved.

59. A bag of 20-10-10 fertilizer costs $10.00, and the same size bag of 30-15-15 costs $13.00. Which bag supplies the most nutrients at the least cost?

a. 20-10-10 at $10.00
b. 30-15-15 at $13.00
c. Cannot be determined
d. Both cost the same per nutrient

Competency:

The student will practice safety when applying pesticides.

60. When working with pesticides, which of the following pesticide handling statements is FALSE?

a. Reading and following label instructions.
b. Wearing appropriate safety equipment.
c. Transferring pesticides to handy containers.
d. Posting signs in sprayed areas showing the earliest date that the crop can be harvested or the field entered.

61. The three methods by which a pesticide can enter your body are oral, dermal, and inhalation.

a. True
b. False

Competency:

The student will keep crop production records.

62. Which of the following is NOT necessary for a complete crop production record?

a. Number of acres planted
b. Percent germination of seed
c. Total amount of grain produced
d. Amount of fertilizer applied

63. A crop production record should include both costs and returns to calculate the profit earned from the planting and harvesting of the crop.

a. True
b. False

64. A farmer is currently growing wheat on a 40 acre tract of land and plans to use a partial budget to determine if barley would be more profitable. Which of the following items would NOT be included in the partial budget?

a. The cost of the land
b. Production costs for wheat
c. Production costs for barley
d. Winter grazing from each crop

Competency:

The student will analyze crop production records.

65. To determine the average yield of corn per acre, a farmer must use each of the following figures EXCEPT.

    a. Number of bushels produced
    b. Number of pounds of seed planted per acre
    c. Number of acres planted in corn

66. A farmer has an average fixed cost of $12.00 per acre on land planted in corn. Assuming the variable cost required to produce one bushel of corn remains the same, if the farmer increases corn production per acre, he will:

    a. Lower the per bushel cost of producing corn.
    b. Increase the per bushel cost of producing corn.
    c. Not affect the per bushel cost of producing corn.
    d. Decrease the variable costs per bushel of corn.

Competency:

The student will determine needs for insurance.

67. Of the types of insurance listed below, which is the MOST important for the farmer with an investment capital of $500,000 in land and machinery?

    a. Crop insurance
    b. Term life insurance
    c. Fire insurance on all major farm property
    d. Extended coverage on farm property

68. How much variation is there in the cost of insurance policies?

    a. No variation
    b. Little variation
    c. Great variation

69. The kind of insurance that insures against accidents which happen to farm workers and is backed by the Federal Government is called:

    a. General liability
    b. Blanket coverage
    c. Social security
    d. Workman's compensation

Competency:

The student will plan labor and capital needs.

70. When planning farm labor needs, a farmer needs to consider which of the following kinds of labor costs?

a. Fixed and variable
b. Past and present
c. Present and future
d. Insurance and management

Match the following items with their correct definition in questions 71 - 73.

A. Operating Expenses
B. Net Worth
C. Capital Expenses
D. Net Cash Income

71. Total income minus total expense: _____

72. Cost of items used in production of income: _____

73. Computed by subtracting the value of liabilities from value of assets: _____

74. A farmer with limited capital in need of temporary life insurance protection should purchase:

a. A whole-life policy
b. An endowment policy
c. A term policy
d. A limited-payment policy

75. It is profitable for a farmer to borrow money to expand farm business when the borrowed money:

a. Returns more than the cost of borrowing money.
b. Can be secured at a low interest rate.
c. Will increase the volume of business.
d. Is used to purchase new equipment.

76. A decline in value of an asset over its useful life associated with use, age, and obsolescence is known as:

a. Appreciation
b. Depreciation
c. Inventory
d. Hedging

77. With limited capital, a farm operator would tend to invest his available capital in:

a. Long-term land improvements
b. New machinery and equipment
c. Quick turnover operations
d. Labor saving equipment

Competency:

The student will identify marketing outlets.

78. The difference between the amount consumers pay for a final product and the amount producers receive is called:

a. Marketing margin
b. Marketing channel
c. Marketing outlet
d. Markup

79. A condition of a market in which no producer or consumer is so large as to control or perceptively affect market supply or market demand is called a:

a. No competition market
b. Free market
c. Pure competition market
d. Cooperative market

80. A process whereby farmers pool their crops or livestock for shipment to market to increase bargaining power is called:

a. Cooperative marketing
b. Capitalistic marketing
c. Discount marketing
d. Barter marketing

Competency:

The student will trouble shoot for minor farm power and machinery problems.

81. A practical and accurate means for checking compression on a single cylinder engine is to:

a. Remove spark plugs and check with a compression gauge.
b. Hand-spin fly wheel against compression stroke and note the rebound.
c. Use torgue wrench on fly wheel to measure pounds of resistance to turning.
d. Use a vacuum gauge at air intake of carburetor.

82. In 4 stroke cycle small engines, the most probable source of low compression is:

a. Bad valve(s)
b. Carburetor out of adjustment
c. Bad spark plugs
d. Blocked exhaust ports

83. When a gravity type fuel system on a small engine is not providing fuel into the cylinder and there is gasoline in the tank, the first step in locating the probable cause would be to find out if the:

a. Intake valve is stuck closed
b. Main jet is correctly adjusted
c. Fuel line is clear
d. Carburetor bowl is full of gas

84. If a tractor is giving off black smoke from the exhaust pipe when under a heavy load, the fuel mixture is:

a. Too lean
b. Too rich
c. Just right
d. Can't tell from this information

85. The adjustment of the idling speed of a tractor engine should be done:

a. When engine has warmed to operating temparature
b. While the tractor is moving
c. When the engine is cold
d. Before setting the breaker point gap

86. Which of the following combinations would be the appropriate procedure to avoid damage to parts of an electrical system when removing and installing a battery?

a. Disconnect ground strap first and connect ground strap first.
b. Disconnect ground strap last and connect ground strap first.
c. Disconnect ground strap first and connect ground strap last.
d. Disconnect ground strap last and connect ground strap last.

Competency:

The student will use service and repair manuals.

87. Using the following chart, how many quarts of antifreeze are required for a tractor with a cooling system capacity of 18 quarts if the desired protection temperature is -10°.

a. 5 quarts
b. 6 quarts
c. 7 quarts
d. 8 quarts

FREEZING PROTECTION TABLE

Cooling System Capacity in Quarts	"Permanent" Antifreeze Required								
	1	2	3	4	5	6	7	8	9
5	16°	-12°	-63°						
6	19°	0°	-34°						
7	22°	7°	-17°	-54°					
8	23°	11°	- 7°	-34°	-69°				
9	24°	14°	0°	-21°	-50°				
10	25°	16°	4°	-12°	-34°	-62°			
11	26°	18°	8°	- 6°	-23°	-47°			
12		19°	10°	0°	-15°	-34°	-57°		
13		21°	13°	3°	- 9°	-25°	-45°	-66°	
14			15°	6°	- 5°	-18°	-34°	-54°	
15			16°	8°	0°	-12°	-26°	-43°	-62°
16			17°	10°	2°	- 8°	-19°	-34°	-52°
17			18°	12°	5°	- 4°	-14°	-27°	-42°
18			19°	14°	7°	0°	-10°	-21°	-34°
19			20°	15°	9°	2°	- 7°	-16°	-28°
20				16°	10°	4°	- 3°	-12°	-22°
21				17°	12°	6°	0°	- 9°	-17°
22				18°	13°	8°	2°	- 6°	14°

Competency:

The student will demonstrate the use of major farm machinery units such as plows, discs, and mowers.

88. When hauling equipment on a trailer, it should be loaded so that the center of the load is:

    a. Right over the axle
    b. Behind the axle
    c. Slightly ahead of the axle
    d. In any position relative to the axle

89. In set-up instructions, right and left hand references are determined by:

    a. Facing the front of the equipment
    b. Standing at the rear of the equipment and facing in the direction of travel.
    c. Calling the company representative and asking him.

90. Oil on gears and chains of farm machinery may actually be harmful to these parts if the machinery is used in:

    a. Sandy conditions
    b. Very hot climates
    c. Muck or high clay soils
    d. Very cold weather

91. The runners of row crop planters should be adjusted so they are:

    a. Slightly toed in at the front
    b. Slightly toed out at the front
    c. All angled slightly to the left
    d. Set perfectly straight at 90° to the planter frame

92. If either the plow goes too deep or the front end of the plow is riding high, the probable cause is:

    a. Improper verticle hitch adjustment
    b. Improper horizontal hitch adjustment
    c. Improper farrow wheel adjustment
    d. Excessive load

93. The wheel clearance of a plow is adjusted for easy or hard plowing by raising or lowering the:

    a. Hitch
    b. Draw bar
    c. Rear farrow wheel
    d. Front farrow wheel

ANSWER KEY

AGRICULTURAL PRODUCTION COMPONENT

1.	B	46.	A	91.	D
2.	B	47.	C	92.	A
3.	D	48.	B	93.	C
4.	D	49.	D		
5.	A	50.	C		
6.	C	51.	B		
7.	A	52.	A		
8.	B	53.	A		
9.	D	54.	B		
10.	B	55.	A		
11.	D	56.	C		
12.	C	57.	C		
13.	D	58.	D		
14.	A	59.	B		
15.	C	60.	C		
16.	A	61.	A		
17.	A	62.	D		
18.	C	63.	A		
19.	C	64.	A		
20.	B	65.	B		
21.	D	66.	A		
22.	A	67.	C		
23.	C	68.	C		
24.	B	69.	D		
25.	A	70.	A		
26.	C	71.	D		
27.	B	72.	A		
28.	B	73.	B		
29.	A	74.	C		
30.	C	75.	A		
31.	D	76.	B		
32.	A	77.	C		
33.	B	78.	A		
34.	D	79.	C		
35.	C	80.	A		
36.	D	81.	B		
37.	A	82.	A		
38.	D	83.	C		
39.	A	84.	B		
40.	C	85.	A		
41.	B	86.	C		
42.	E	87.	C		
43.	A	88.	A		
44.	D	89.	B		
45.	C	90.	A		